THE NATIONAL GUARD'S DISTRIBUTIVE TRAINING TECHNOLOGY PROJECT: STANDING READY TO SUPPORT THE GLOBAL INFORMATION GRID

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ABSTRACT

To support its Distributive Training Technology Project (DTTP) - an advanced distributed learning (ADL), information-delivery, and communications system designed to enhance the National Guard's readiness capabilities and fulfill related missions - the National Guard built a nationwide terrestrial network to link sites in all 54 states and territories. This communications backbone, which consists of lines ranging in size from T1s to OC-3s, permits real-time audiovisual links among all State Area Commands and hundreds of other state-designated sites throughout the country.

This robust network currently connects more than 300 multimedia classrooms, ranging in size from two seats to 30 seats. Current plans call for the installation of 478 classrooms by the end of 2003. There are also 61 single-trainer classrooms. Communications capabilities include audio- and video-teleconferencing, teletraining, Internet access, and metering.

DTTP's primary mission is to promote military readiness throughout the Guard and other military organizations by offering access to ADL tools, technologies, and courseware. Other missions are to enhance command, control, communications, and computers (C4) capabilities; and to make DTTP resources available to other public and private agencies on a cost-reimbursable basis.

Because of the network's reliability, DTTP resources have been used to provide communications and other support during times of crisis. Even before 11 September 2001, for example, project personnel were working to leverage the DTTP system and its network capabilities to support C4 requirements for homeland security. As a result, the DTTP was able to distinguish itself as a crucial and reliable communications tool in the wake of the terrorist strikes on the World Trade Center. Project personnel established and sustained a critical, continuous 24-hour communications link among Guard commands in New York, New Jersey, and Connecticut. Command staffs at these sites used the link to coordinate emergency responses, deploy troops, and resolve logistical problems - at a time when land-line and cellular networks were overcome by volume. In Washington, the DTTP also connected Guard leadership in Virginia, Maryland, and the District of Columbia after the Pentagon attack.

In addition, the National Guard Bureau, in partnership with such organizations as the Centers for Disease Control, the Federal Emergency Management Agency, and the National Terrorism Preparedness Institute, has for some time been using its terrestrial and satellite networks to support emergency-response training. Since 11 September, the Guard has supported more than 20 satellite teleconferences for military and civilian emergency-response communities at more than 500 locations around the country.

This paper describes the growing use of DTTP resources to provide stable, nationwide communications support, especially in times of natural disasters (floods, fires, hurricanes, tornadoes, etc.) and manmade crises (e.g., the terrorist attacks in New York and Washington). Topics include planning and implementation of the terrestrial network as well as efforts to integrate with the Air National Guard's WarriorNet satellite network. The paper also addresses other promising technologies that will enhance the Guard's ability to maintain and expand its effective and reliable communications network.

INTRODUCTION

The National Guard is the only military entity whose primary function is to meet both federal and state missions. In the federal arena, the Guard supports total force readiness, accounting for more than 55 percent of the armed forces. In addition, the Guard is playing an increasing homeland-security role after the Sept. 11 terrorist attacks on the World Trade Center and the Pentagon; since Sept. 11, more than 50,000 National Guardsmen and -women have been called to active duty to support homeland defense by guarding bridges, securing power plants and airports, patrolling national borders, and flying air patrols over major cities.

At the state level, the Guard performs stability and support activities -- responding to natural and man-made disasters, maintaining the peace, and providing a community presence.

In 1995, partly to take advantage of the National Guard's Federal-State mission and its deep community roots, Congress appropriated $7.5M for the National Guard to develop and install nine distributed learning (DL) prototype classrooms in Pennsylvania, Maryland, Virginia, and West Virginia. Today, the DTTP operates approximately 315 multimedia classrooms and has a leased, national communications backbone in place – an Asynchronous Transfer Mode (ATM) network called GuardNet XXI – to support DL and communications in all 50 states, three territories, and the District of Columbia. The Guard plans to field approximately 480 classrooms by 2003.

DTTP MISSIONS

The DTTP was designed to fulfill three primary missions: promote military readiness; improve Command, Control, Communications, and Computers (C4); and explore public-private partnerships involving the "shared use" of DTTP resources.

Mission: Readiness

Mission Statement: To improve readiness by providing greater access to military training and education.

As the Army transforms to meet new challenges, it is essential that soldiers build and maintain a high state of readiness, especially in relation to homeland security and deployments to areas such as Afghanistan, Southwest Asia, Bosnia, and Kosovo. National Guard soldiers are expected to be fully trained and equipped upon arrival in an area of operation, but this is not always the case. In many instances, soldiers must receive out-of-cycle training to achieve the required knowledge and raise their skill levels.

For example, one of the National Guard's greatest challenges today is the insufficient number of military maintenance technicians. The complexity of weapons and communications systems is increasing, as are mission support requirements. As a result, the need to build skills and maintain military readiness is greater than ever before.
The DTTP enables the Guard to maintain the required readiness by leveraging leading instructional methodologies, information systems, and communications technologies to deliver education, training, and performance-enhancing tools. Key advantages include the ability to:

- Train more soldiers at the same time, lowering the cost of instructors and transportation

- Reduce the amount of time it might take to deliver requisite training to multiple large groups

- Broaden the scope of education, making more information available to more people at the same time

DL has emerged over the last few years at the forefront of training, education and information access, and is considered to be the dominant trend in National Guard training. The communication technologies needed to support DL are having a major impact throughout the Guard because they bring greater access to information, which, in turn, will improve training and operations. Part of the strategy to improve readiness is the shift from traditional resident training to greater reliance on DL, using emerging technologies to bring the learning to the learner.

Mission: Improve C4

Mission Statement: To improve and facilitate Command, Control, Communications, and Computers (C4) within the National Guard.

To fulfill its dual federal/state mission in the most effective, efficient, and productive manner possible, the Guard explores opportunities to use information technology solutions wherever possible. In addition to wide-area network (WAN) communications infrastructures, each state has a State Area Command (STARC) node to provide focus for all communications within the state and between state and federal authorities. The STARC node consolidates National Guard voice, video, and legacy data networks. Each STARC hosts a DTTP classroom, which supports interstate communications and information exchange. During tests, DTTP personnel have successfully linked all 54 STARCs, ensuring the availability of rapid, reliable, and consistent coast-to-coast communications resources.

In addition, DTTP classrooms – at STARCs and elsewhere – can be expanded rapidly to provide emergency communications links and serve as command/control centers in times of crisis. Within hours of the terrorist strikes on Sept. 11, for example, DTTP provided a critical 24-hour communications link among National Guard and active military commands in Washington, New York, New Jersey, and Connecticut.

Similarly, DTTP classrooms in West Virginia served as Federal Emergency Management Agency (FEMA) operation centers during the dangerous floods that swept through the state in 2000. In the fall of 1999, emergency

responders in North Carolina used DTTP classrooms for more than 50 consecutive days as mission control centers during Hurricanes Floyd and Dennis. DTTP facilities in North Carolina also served as headquarters for Y2K crisis-management activities.

Mission: Explore Shared Use

Mission Statement: To foster economic development, increase educational achievement, and improve information access for the local communities in which the National Guard is based.

One of the congressional goals for the National Guard is to support community use of the DTTP through a concept known as "shared use." To that end, DTTP has launched an aggressive campaign nationally and locally to build partnerships with public and private organizations that wish to take advantage of its resources to improve their training, education, and communications capabilities. Partnerships can be formed at the national level through the National Guard Bureau; at the state or territory level with the offices of the Governor or Adjutant General; or at the local level, between a community entity and an individual site. The National Guard is one of the first agencies to use this business concept in conjunction with DL capabilities.

DTTP provides a mechanism through which other military agencies, businesses, schools, professional practices, and the community-at-large can gain access to the information and technologies that are changing our educational perspectives. The innovative approach of reaching outside the government for DL resources is a "best practice" that the program continues to expand upon.

CLASSROOM RESOURCES

DTTP classrooms consist of various hardware and software components that support the delivery of training and the exchange of knowledge across the country.

GuardNet XXI: GuardNet XXI is the National Guard Bureau's (NGB's) telecommunications network. It is an Asynchronous Transfer Mode (ATM) network that supports DTTP as well as a number of Army National Guard enterprise management programs.

The existing GuardNet XXI infrastructure consists of seven regional hubs, 54 STARCs, and classroom servers. Each GuardNet XXI regional hub serves a predefined geographical region of the United States. In each state, a STARC level node functions as an ATM switching center between that state's classroom server(s) and the corresponding regional hub.

Integrated Information System (IIS): DTTP is administered through the Integrated Information System (IIS), a system of hardware and software that provides classroom capabilities to support readiness training and shared use. The IIS is centrally managed yet allows sites to operate independently at the classroom level. It provides users with access to all network content and services and maintains a repository of content (i.e., courses and information) at the national level. When users request content, the IIS downloads the specific content to their local servers. The IIS meters and tracks DTTP services used and maintains individual user account registries. It also integrates the scheduling of local and networking resources. Users can schedule resources within the IIS using computers that are part of GuardNet (i.e., in a DTTP classroom or on another computer connected to GuardNet). In the future, users will be possible to perform the above functions on a computer outside GuardNet.

IIS users include project personnel and end users (clients or customers). Project personnel maintain and operate the IIS. Individual end users register, schedule, and launch services. Site administrators perform various functions associated with scheduling events and maintaining user records.

DTTP Classrooms: DTTP classrooms provide Guard members and their communities broad access to education, training, and information for the development of new skills and lifelong learning. These classrooms establish and link communities to state-of-the-art learning and information centers, focusing on the education and training needs of the National Guard, the communities, local businesses, and government. NGB DTTP classroom servers are located in each state, three U.S. territories, and the District of Columbia. Each server contains databases, content, and hardware sufficient to provide users access to self-paced training, video teleconferencing (VTC), and office services.

The most common type of classroom currently being fielded includes three to 44 workstations (3, 12, or 18 workstation base classroom configuration); a classroom printer and a fax/copier machine; a document camera; two-way video and two-way audio conferencing; computer-based and web-based training capabilities (with Internet access); two videocassette recorders (VCRs); one T1 (digital telephone) and three POTS (Plain Old Telephone Service) analog telephone lines; productivity tools such as Microsoft Office Suite; and, through the IIS, nationwide scheduling, content distribution, and metering functions.

These classrooms support computer-based training (CBT); group training presentations; individualized training and multimedia use; Internet access; onsite printing; point-to-point and multipoint conferences (using NetMeeting); audioconferences; video-teleconferences; multi-site broadcasts, and other activities.

CURRENT INITIATIVES

To help satisfy the project's congressionally mandated missions to promote military readiness, provide enhanced communications to the military, and use its resources for the benefit of the American people, DTTP personnel are actively and aggressively pursuing a number of new initiatives:

- A partnership with the Army's Defense Language Institute (DLI) to support language training – skills that could be critical to homeland security and the War on Terrorism, both at home and around the globe
- A partnership with the National Aeronautics and Space Administration (NASA) to generate excitement about math, science and technology among middle and high school students
- A partnership with the Army Simulation, Training, and Instrumentation Command (STRICOM) to deliver advanced simulation training in support of military readiness and homeland security

DLI

Recognizing the growing need for foreign language skills in today's military, DTTP joined forces with the Army National Guard Training Division and the U.S. Army Defense Language Institute (DLI) Foreign Language Center to deliver enhanced language-skills training to soldiers and military linguists across the nation.

The collaboration covers the entire language-training lifecycle, from course development and execution to nationwide delivery. The program takes advantage of innovative teaching methods and advanced learning technologies that combine online study with live interactive instruction. Because of its significance to current national needs, the program is one of the most sought-after language skills curricula in the military today.

The partnership dramatically extends the reach of DLI's language courses and makes them more accessible to specialists around the nation. It comes at a crucial time, because the security challenges facing the nation – on both national and global levels -- have created a growing need

for soldiers with foreign language skills. Competency in critical languages, such as Arabic, increases the country's ability to respond to terrorist activities around the world.

The program, which addresses reading, writing, and listening skills, consists of three components: a web-based online portion; online homework, which includes links to glossaries, dictionaries, and foreign-language websites; and a live, video-teleconferenced portion in which students can discuss issues with their instructors and receive additional guidance. This third component also contains a sound-design module for speaking and listening practice.

To enhance military language skills even further, DTTP also offers more than 30 computer-based language courses, ranging from basic "survival" language instruction to higher-level communications training. The Colorado National Guard recently used DTTP resources to train up to 150 soldiers at the DTTP classroom in Denver using language software and video instruction for the Pashto language, a main Afghan dialect spoken primarily along the Pakistan border, where U.S. forces -- partly composed of members of the National Guard -- are searching for al Qaeda elements.

NASA

The Education Division of the National Aeronautics and Space Administration (NASA) develops educational programs to generate interest in math and science among middle and high school students, and to attract them to careers in these fields. A collaboration between NGB and NASA to deliver these programs enables NASA to reach a much wider audience – including those students without access to computers, who might not otherwise be able to participate in these programs. It also helps DTTP fulfill its mission to provide educational and lifelong learning opportunities to all Americans.

DTTP helps deliver these programs, which mix fun with learning, to thousands of kids across the country, who are able to access them from DTTP facilities at Guard armories, community centers, college and university campuses, and other accessible, state-designated locations. Some of the ideas being discussed are multi-state distribution of NASA Connect's "Having a Solar Blast" program; development of the "Kids' Interactive Virtual Shuttle," in which thousands of young people use DTTP classrooms to participate in selected activities with Shuttle astronauts in space and work in tandem with ground-based scientists; and the potential installation of a DTTP classroom in a NASA facility.

The collaboration could have wide-reaching impact. By helping more students access NASA's educational programs, NGB will help increase the number of children who will seek careers in science, math, and technology, which, in turn, will lead to a better-skilled workforce and a stronger economy.

Three demonstrations have taken place under the partnership thus far, and more are being planned to engage students in different parts of the country.

The first demonstration took place on March 28, 2002. Working from the DTTP classroom at the Regional Training Institute in Austin, Tex., 16 seventh- and eighth-grade students from Austin's Kealing Junior High explored "Space Farming" with educators from NASA's Johnson Space Center (JSC), where the program originated. The students who took part in the event were, at that time, designing a "mission to a planet" project in their science class, and the program had a profound impact on their class objectives.

The second demonstration took place on April 18, 2002. This time, 11 sixth graders from Virginia's Thornburg Middle School, 10 sixth graders from Maryland's Hebrew Day Institute, and 26 students from Bartlett High School in Austin, Tex., worked with JSC educators to study another of NASA's educational programs entitled "Imagery from Space." The hour-long video-teleconference linked DTTP classrooms at NGB headquarters in Arlington, Va., the ADL Co-Lab in Alexandria, Va., and the Regional Training Institute in Austin, Tex., with the NASA facility. Using satellite images and interactive graphics, the educators led the students through lively discussions about the Earth's geological history, cataclysmic events such as volcanic eruptions and meteor strikes, and the long-term effects of human activity on the planet.

In the third demonstration, held May 23, 2002, 12 fourth-grade students from Springwoods Elementary School in Woodbridge, Va., worked with JSC educators to explore "The Effects of Space on the Human Body." Students learned about effects such as bone and muscle degradation, cardiovascular system changes, and space sickness, and explored ways to prevent or mitigate them.

The NASA-NGB partnership is part of NASA's new thrust to bolster the space agency's youth-education efforts. Under the leadership of Sean O'Keefe, who became NASA administrator in December 2001, NASA is placing greater emphasis on research and education, especially the development of technology to improve space exploration and promote national security. O'Keefe's strategy calls for more science-based space exploration and innovative ways

to inspire future scientists and explorers. Through the partnership, NASA provides the educational content, as well as the scientists, engineers, and astronauts to teach it; and the NGB provides the infrastructure, through its DTTP, to deliver NASA's content to middle- and high-school students nationwide, using its network of advanced, multimedia classrooms.

NGB already supports a number of youth-oriented initiatives, including the ChalleNGe program for at-risk high-school dropouts 16 to 18 years old; and the Starbase program, designed to improve math and science skills in kids aged 6 though 18. NGB also supports Fort Discovery in Atlanta, Ga., the result of a partnership between the National Science Center (NSC) and the U.S. Army. Fort Discovery is a family-oriented math and science center, and home to an array of national educational outreach programs, as well as a DTTP facility. NSC frequently uses DTTP resources to support its missions – for example, to conduct long-distance video-teleconference sessions to train middle- and high-school teachers on how to use Starlab, NSC's portable, inflatable classroom and planetarium system.

STRICOM

In the post-9-11 world, readiness training and homeland defense have become top priorities. The National Guard is contributing to the War on Terrorism by offering modern, state-of-the-art simulation and virtual training to soldiers across the country. These advanced training offerings are the result of an evolving partnership involving NGB, a number of states (New Jersey, Iowa, Oklahoma, Kansas, and Washington), the ADL Co-Lab, and STRICOM.

STRICOM leverages technology from a myriad of sources, including Hollywood, academia, and industry, to create synthetic environments so compelling and lifelike that participants react as if they were real. Under a partnership being forged between NGB and STRICOM, DTTP will deliver STRICOM 's vast array of simulations tools directly to soldiers in classroom situations across the country.

STRICOM offers more than 145 simulations and simulators, including those that provide battle simulation for battle focus training. Other planned simulation efforts involve Specter, from the National Simulation Center, and a variety of simulation gaming programs designed to improve readiness and enhance training.

For the DTTP, the ultimate goal in this effort is to leverage DTTP's content-delivery capabilities to support similar training efforts throughout the Guard and the military.

SHARING THE WEALTH

Many issues confronting the NGB – including shifting roles and responsibilities; the need to attract and retain high-quality personnel; the need to transfer knowledge in the face of attrition; the demand for enhanced communications; and budget constraints – are shared by all organizations in the public and private sectors. The NGB's shared use partnerships enable federal and state agencies, non-profit organizations, businesses, and academia to leverage the DTTP's resources to fulfill their own missions and effectively address these universal problems. The partnerships also encourage collaboration among these disparate entities, which promotes sharing of information, ideas, and technologies.

The associated costs and technical challenges make it virtually impossible for most agencies and organizations to establish a nationwide network to serve their individual training and communications needs; however, the availability of the NGB's resources enables these organizations to use the emerging technologies while minimizing related investment and infrastructure costs. Furthermore, the Guard views the project as a "work in progress" and devotes significant resources toward continual improvements and upgrades, which most organizations could not support. Instead, these entities can benefit from – and contribute to – the Guard's success as it develops DL and communications tools, reviews and implements industry best practices, and keeps pace with technologies that are evolving at Internet speeds.

The National Guard is engaged in an aggressive campaign nationally and locally to build partnerships with public and private organizations that can benefit from DL. Shared Use partners can be formed with military agencies; federal, state, and local governments, private industry; non-profit groups; trade associations; colleges and universities; and community groups. Partnerships are formed at the national level through the National Guard Bureau; at the state or territory level with the Governor's or Adjutants General's offices; and at the local level, between community entities and individual DTTP sites.

MOVING FORWARD

DTTP is revolutionizing the way that the National Guard trains its soldiers and stays connected to the communities it serves. In the ever-expanding world of DL, DTTP is an industry leader in terms of advanced technology and deployment, and has been recognized as one of the foremost programs of its type within the Department of Defense.

As technology evolves, DTTP's challenge is to ensure continued system reliability while leveraging new and emerging innovations (wireless technology, expanded satellite communications, etc.) to maintain a leading edge.

The keys to the project's success have been a rigorous requirements definition process and an evolutionary development process, both of which have become more and more disciplined as the field of distributed learning has matured. These processes, combined with configuration control, create the mechanisms to respond to users' requirements and leverage the appropriate technologies at the right time.

DTTP uses top-down and bottom-up analyses to define what makes sense and what constitutes good business in a field where exponential change is the norm. Evolutionary development is the only approach that works in an environment dependent not only on technology but also on a volatile field like distributed learning. Policy changes that reflect the learner-centric approach to training and education mean changes in system architecture and interoperability requirements. New procedures for developing and tracking content, new ways of organizing and tailoring information, new expectations for sophisticated user interfaces – all of these have appeared since DTTP was initiated. Such changes must be anticipated and factored into the evolving system.

Project Priorities

As military, training, and technological requirements change, so too will the DTTP. The DTTP already has a clear set of priorities that it will meet in the coming years. These goals include, but are not limited to, providing states with additional resources with which to operate their classrooms, building a training portal, increasing enterprise audio/video bridging resources, engineering the next generation of DTTP classrooms to support collective and advanced simulation training, and defining and implementing the technologies that will advance the "anytime, anywhere" goal of distributed learning. Some of these goals are closer on the horizon than others, and most are already in progress.